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ABSTRACT

This study identifies major problems and concerns encountered when attempting to apply the multifaceted classification model developed by Campbell and others (1981) called "Patterns of Participation," which describes the multiple ways that secondary students participate in vocational education and how their courses are classified. It also assesses how well the outcomes of those applications replicated or verified selected empirical results reported by the model's developers. The model was applied to the high school transcripts of samples of students from three urban school districts. Two major conclusions were reached. The first conclusion is that while no debilitating problems were encountered during the applications of the model, a number of conceptual and operational concerns were identified. These concerns include the following: (1) Local school districts often use unique course titles that do not correspond directly with those listed in the codebook of the model; (2) local districts define and offer more general courses than those cited in the codebook; (3) some courses do not fit into the model's definitions; (4) some definitions and rules of the model need clarification; and (5) certain vocational programs are "discriminated" against by the model. The second conclusion was that the model is replicable across data sets and should, therefore, be of use to vocational planners and researchers. (KC)

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RESEARCH REPORT: Patterns of Participation in Vocational Education by Secondary Students in Several LEAs

The National Center for Research in Vocational Education
The Ohio State University
1960 Kenny Road
Columbus, Ohio 43210

1983

CE 035 356

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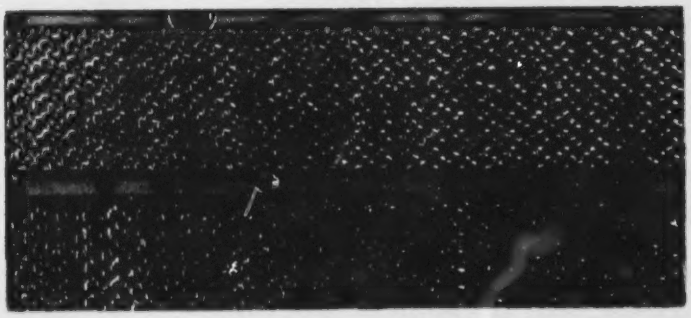

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FOREWORD

Research over the last decade has suggested that the traditional tripartite classification scheme used to categorize secondary students as either college preparatory, general, or vocational students does not reflect adequately the variability that exists either across or within secondary programs. The failure of such a scheme is particularly evident when dealing with vocational students, due to the diversity that characterizes the vocational experience. The nature and extent of that diversity is reflected in the multidimensional, descriptive model of secondary students' patterns of participation in vocational education developed by Campbell, Orth, and Seitz (1981). Potentially, such a model has important fiscal and operational implications, and the results of efforts to apply that model could enhance our understanding of such research issues as how participation in vocational education relates to students' basic skills attainment.

This report describes an effort to identify major problems and concerns encountered when attempting to apply the multifaceted classification model developed by Campbell et al. (1981) and to assess how well the outcomes of those applications replicated or verified selected empirical results reported by the model's developers. It should provide vocational researchers, planners, and administrators with insights regarding the replicability of the model and the stability of the results observed when relating students' vocational participation patterns to selected background characteristics. The various problems and concerns noted might also serve to suggest cautions to be heeded during future applications as well as potential changes that might be made to help improve the model's overall applicability and utility as a research and planning tool.

The National Center is indebted to Lucille Campbell-Thrane, Associate Director, and to Norval McCaslin and Paul Campbell of the National Center staff, as well as to Richard Edsall, James Hale, University of Florida, and Jessie Roderick, University of Maryland, for their helpful reviews and suggestions. Special thanks go to Deborah Black, who spent many hours typing the manuscript, and to Constance Faddis, who edited the final report.

Robert E. Taylor
Executive Director
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in Vocational Education

EXECUTIVE SUMMARY

In a recent study directed toward systematically assembling and summarizing extant data that bear upon selected relationships between secondary students' basic skills attainment and their participation in vocational education (Weber et al. 1982), it was observed that a variety of somewhat divergent, ambiguous operational definitions were being used by school districts to denote "vocational" and "nonvocational" students. For example, in a number of instances, if students completed one vocational course offered by a school district, they were deemed vocational students. In other instances, if students designated themselves as vocational students, they were classified as such by their school district. Generally, the definitions used--

- failed to reflect adequately the complex state of affairs represented by students' decisions to participate in vocational education;
- did not reflect the temporal or transient nature of many students' participation in vocational education;
- did not provide for such phenomena as "initial curricular branching" or "intercurricular migration." (Berryman 1980)

In an effort to address the problem of definition noted above, Campbell, Orth, and Seitz (1981) developed a multidimensional, descriptive characterization of various patterns of participation in vocational education that are exhibited by secondary school students. That characterization or model was derived using the high school transcripts of a nationwide

subsample of students from the National Longitudinal Survey of Youth Labor Market Experience (Borus et al. 1980). Although the "Patterns of Participation" Model appears to offer promise with regard to resolving the indicated kinds of definitional ambiguities, further evaluation is needed regarding its potential applicability to diverse data sets, and hence, its utility to vocational planners, administrators, and researchers.

The intent of the study described in this report was (1) to apply the Patterns of Participation Model to the high school transcripts of samples of students from three urban school districts, (2) to identify any unique problems and exceptions encountered during those applications, and (3) to attempt to discern how well the outcomes evolving from those three applications replicated the results reported earlier by Campbell et al.

Conclusions

- While no debilitating problems were encountered during the applications of the model (i.e., the procedures and decision rules specified in the model could be "reliably" applied), a number of conceptual and operational concerns were identified. Several of the most general of those concerns were as follows:
  1. Local school districts often employ unique course titles that do not correspond directly with those listed in the course Codebook employed via the Patterns Model.
  2. Local school districts define and offer more general courses than those cited in the Model Codebook and

they often subsume a number of specific courses listed in the Codebook.

3. Courses (e.g., management training) were specified by several school districts that did not fit into the service area designations employed by the model.
4. The definition of "supportive diversity" and the related notion of "individual entrepreneurship" need to be explicated further.
5. Decision rules regarding the disposition of selected kinds of courses (e.g., home economics, industrial arts, and some technical courses) need to be explicated further.
6. Certain vocational programs (e.g., distributive education) are "discriminated" against by the model, since they include fewer courses and are offered late in students' high school careers.

- The model is replicable across data sets and should therefore be of utility to local and state vocational planners and researchers, particularly if such concerns as those noted are resolved in ways that parallel those employed in the current study.

INTRODUCTION

Students in secondary education settings have traditionally been categorized as either college preparatory, general, or vocational students. As demands for educational accountability have increased, however, particularly with regard to the efficacy and effectiveness of various educational programs, it has become apparent that such a tripartite classification scheme may not adequately reflect the variability that exists either within or across secondary programs. At best, the three designated categories describe modal patterns of courses completed by secondary students, and are not mutually exclusive. Furthermore, such a scheme fails to reflect the diversity that characterizes the vocational experience, and "grouping all vocational students together and treating them as a homogeneous conglomeration can only lead to false conclusions..." (Brown and Gilmartin 1980, pp. 43-44).

The purpose of the study described in this report was to (1) apply a multifaceted classification scheme of various patterns of participation in vocational education by students from three local education agencies (LEAs); (2) identify problems encountered in those applications; (3) provide information that can be used to help identify problems and issues surrounding the utilization of such a classification scheme; and (4) improve researchers' capability to test for and evaluate the outcomes to be derived from participation in vocational education, particularly as those outcomes relate to research and policy formulation issues.

Background

In a recent project conducted by staff at the National Center for Research in Vocational Education (Weber et al. 1982), an effort was made to secure systematic information that could be used to address such issues as (1) What level of basic skills attainment characterizes secondary vocational students? (2) How does participation in vocational education affect basic skills attainment, if at all? (3) How do the basic skills levels of vocational students compare with those of nonvocational students? and (4) What relationships, if any, exist among secondary students' basic skills, participation in vocational education, and such outcomes as completing school, earnings, employment, and securing additional training? One of the basic research concerns that surfaced early in the course of that study dealt with the identification and classification of students as "vocational" or "nonvocational" students.

The various data sets that were reviewed and analyzed revealed that several somewhat divergent operational definitions were used to denote those categories of students. In the most prevalent case, if students completed one vocational course offered by an LEA, they were deemed vocational students by that LEA. In other cases, if the students designated themselves as vocational students or if that designation was made for them by a counselor or principal, they would be classified as such by their LEA (for recordkeeping, funding, and related purposes). Generally, the definitions used--

- failed to reflect adequately the complex state of affairs represented by students' decisions to participate in vocational education (e.g., college-bound students may "explore" several vocational programs that relate to areas of study they may subsequently pursue at a professional level);
- did not reflect the temporal or transient nature of many students' participation in vocational education (e.g., students may complete several vocational courses during their sophomore year, then drop out of the related program, and after another interval of time participate in some form of "unstructured work experience" that may or may not be related to the area addressed by the courses completed earlier).

The identification and classification of vocational students have important fiscal and operational implications, since most vocational programs are planned, funded, and operated on the basis of the numbers of students they enroll. Furthermore, the results of any process designed to identify and classify vocational students have major implications for enhancing our understanding of such research issues as the relationships between basic skills and participation in vocational education that were studied by Weber et al. (1982).

The overly simplistic, ambiguous description of participation in vocational education is not a new or unique problem. It is evidenced in the process of classifying students as vocational students if they enroll in <u>one</u> vocational course (e.g.,

typing or bookkeeping). Numerous researchers have encountered and helped explain this concern:

- Mertens et al. (1980) noted that vocational programs are often similar in name only and that considerable variation may exist even within programs. Such an observation has important consequences for assessing the validity of the effectiveness of specific studies and conducting comparisons of findings among studies.
- Berryman (1980) suggested that previous researchers appeared to be unaware of the underlying issues and alternative classification schemes for describing students' variant participation in vocational programs.
- Fleming, Maroney, and Straser (1975) found that many high schools make few distinctions among the available curricula (i.e., vocational, academic, and general) and that firm agreement exists only with regard to distinctions among academic courses (e.g., with regard to what "discipline" they represent). The authors contend that this lack of clarity may help explain why the research literature has reported so few differences between vocational and general curriculum students on such criteria as basic skills proficiency, earnings one year after graduation, and interest in participating in post-secondary schooling.
- Brown and Gilmartin (1980) found (1) only slight differences in the number of vocational courses taken by students reported to be in a vocational program and

students who were taking vocational courses as electives, (2) that due to longer class periods the vocational program students received about 56 percent more instruction (in terms of hours per week) than the elective takers, and (3) that students in different vocational programs completed different numbers of vocational courses within and outside their respective program areas.

Other research has suggested that the use of a single generic category to characterize vocational education participation may directly confound the observed results when attempting to assess the effects of participation in vocational education. For example, movement among the three curricula is usually from a general (or, less often, an academic) program to a vocational program (Bachman 1972; Rosenbaum 1976; Schafer and Olexa 1971). Berryman (1980) has argued that the actual effects of curriculum on various outcomes cannot be accurately estimated because the available data typically do not provide the information needed to determine the rate or timing of "initial curricular branching" compared to "intercurricular migration" (p. 12). In a related vein, Grasso and Shea (1979) have noted that evaluation of vocational graduates, particularly those who enter the program late in their high school careers, may reflect the failures (or successes) of the students' general curriculum studies rather than the vocational instruction they received.

To address the problem of definition noted above, Campbell, Orth, and Seitz (1981) developed a multidimensional, descriptive characterization of various patterns of participation in

vocational education by secondary school students, hereafter referred to as the Patterns of Participation Model. The various dimensions considered as part of that operational definition (i.e., classification process or model) include intensity, diversity, continuity, supportive diversity, and proximity. These dimensions (defined in the next section) as well as the resultant Patterns of Participation Model were derived using the high school transcripts or course histories for a nationwide subsample of students who were originally included in the National Longitudinal Survey of Youth Labor Market Experience, hereafter referred to as the NLS study (Borus et al. 1980). In all, transcript data on 3,056 students were used.

Overview of the Patterns of Participation Model

During their efforts to develop a multidimensional characterization of secondary students' patterns of participation in vocational education, Campbell et al. (1981) started with several basic assumptions regarding vocational education. Those assumptions are as follows:

- Courses in the eleventh and twelfth grades are more important to vocational attainment than those in the ninth and tenth grades.
- Continuity in an area is better than switching areas.
- The more credits individuals have the better prepared they are.
- Continuity in terms of school years is better than broken sequences. (p. 29)

Based upon these assumptions, expected pattern types and results gleaned from previous research (Brown and Gilmartin 1980; Campbell et al. 1981; and Copa and Forsberg 1980 cited in

Campbell et al. 1981), the researchers (Campbell et al.) delineated five key dimensions or concepts to serve as the foundation of the Patterns of Participation Model. Those dimensions were as follows:

- The first concept is intensity. This descriptor is defined as the number of credits earned in a single area of concentration. In order to qualify as part of the measure of intensity, the credits had to be in an area of specialization (e.g., trade and industry, agriculture) in which the student had accumulated at least six-tenths of his or her total vocational credits. There also had to be at least one full credit to earn a score in intensity. The score of an individual is the actual sum of Carnegie Units of the vocational courses taken.

- The second concept is that of diversity. In contrast to specializing in a single program area, a student may take a variety of courses across several program areas without accumulating a substantial body of experience in any single area. The score for this concept is the number of program areas in which courses are taken.

- The third concept is continuity. It is the number of grades in which the area of specialization, as defined for intensity, is pursued. It reflects a different dimension than intensity because, in many cases, a relatively large number of credits were accumulated in a single grade, while in others a similar number were accumulated over two or more years. The score is the actual count of the grades in which greater than a half credit in the specialty was earned.

- The fourth concept is supportive diversity. This concept is tenuous, but was included because an examination of actual patterns suggested the possibility that some across-area work might be supportive of the utilization of the body of knowledge and skills accumulated in a specialty. The score is an actual count of credits earned in courses judged to be potentially related to the specialty. One example would be the benefit of some knowledge of accounting for a self-employed person such as an auto body shop owner. A list of the courses used in the supportive diversity concept is found in Appendix D, Definition of Supportive Diversity Courses. (See figure 1 on page 9.)

- The fifth concept is proximity. This notion rests upon the classic theories relating the rate of forgetting to elapsed time, and upon the possibility of greater know-

ledge of the immediate job market at the time employment is sought. The scale is arbitrary in this instance, although its ordinality has a theoretical base. If more than one-half credit was taken in the specialty in each of the last two years of high school, a score of three was assigned. If specialty courses were taken in the twelfth grade but not in the eleventh grade, two was assigned. If specialty courses were taken in the eleventh grade but not in the twelfth grade, a one was assigned. If no specialty courses were taken in the last two years, a zero was assigned. (Campbell et al. 1981, pp. 30-31)

Table 1 provides a summary listing of these five concepts or dimensions and their associated working definitions.

Given the five dimensions or descriptive concepts indicated, Campbell, Orth, and Seitz constructed a series of five target score profiles that described characteristic patterns of participation in vocational courses. They defined the term "profile" as the set of specific scores on the five dimensions that were assigned to a student in the sample. The term "pattern" was used to denote a type of participation in vocational education and pattern assignments were based upon students' profile scores. (The term "target" was used because those profile scores represented the hypothesized set of score values most likely to be associated with each pattern type.)

The names of the resulting target score profiles and their associated dimension scores are listed in table 2. The perceived hierarchical relationships among those hypothesized target profiles are illustrated in figure 2 (adapted from Campbell et al. 1981, p. 39).

The five target profiles that were derived are as follows:

- The target profile for Concentrator was assigned a value of five for intensity, one for diversity, four for continuity, one for supportive diversity, and three for proximity. The intensity score of five represents a judgment that a Concentrator would probably need to use

APPENDIX D

DEFINITION OF SUPPORTIVE DIVERSITY COURSES

The supportive diversity concept is based on the assumption that students may take vocational courses outside their program area that may be related (or supportive) of the major coursework if the program was structured toward individual entrepreneurship. The speciality areas judged most likely to lead in this direction were agriculture and trade and industry. For agriculture, accounting, bookkeeping, and typing courses were judged to be related. The trade and industry program was determined to be structured toward individual entrepreneurship if one of the following courses was taken:

Automotive mechanics	Commercial photography
Small engine repair	Commercial art
Welding and cutting	Carpentry
Masonry	Construction work cooperative
Textile/leather production	Graphic arts work cooperative
Furniture	Metals work cooperative
Graphic arts	Woodwork cooperative

In this instance, the accounting, bookkeeping, and typing courses were also judged to be related. When counted as a supportive diversity score, the actual credit received in accounting, bookkeeping, and typing is used.

Figure 1. Appendix D from Patterns of Participation in Secondary Vocational Education

SOURCE: Adapted from Campbell et al. 1981, p. 95.

TABLE 1

SUMMARY DESCRIPTIONS OF THE FIVE "PATTERNS OF PARTICIPATION" DIMENSIONS

Concept/Dimension	Working Definition (and Related Score Assignment)
• Intensity	- Number of credits in a specialty area (i.e., an area in which at least .6 of total vocational credits were earned).
• Diversity	- Number of areas in which vocational credits were earned. (Range: 0-6)
• Continuity	- Number of grades in which the same specialty area (as defined for Intensity) was pursued. (Range: 0-4).
• Supportive Diversity	- Number of credits in nonspecialty area(s) that are logically career-related to the specialty area.
• Proximity	- Number assigned according to when specialty courses were taken--3, if vocational credits are earned in specialty area in both 11th and 12th grades; 2, if credits are earned in the specialty area in 12th but not 11th grade; 1, if credits are earned in the specialty area only in 11th grade; and 0 otherwise.

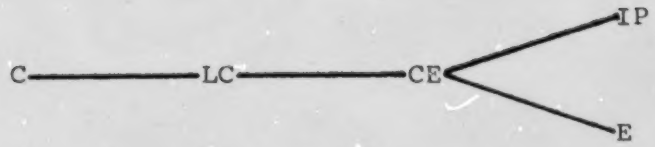
SOURCE: Adapted from Campbell et al. 1981, p. 32.

TABLE 2

FIVE HYPOTHESIZED TARGET PROFILES AND THEIR ASSOCIATED DIMENSION SCORES

Name of Target Score Profile	Dimensions: Intensity	Diversity	Continuity	Supportive Diversity	Proximity
• Concentrator (C)	5	1	4	1	3
• Limited Concentrator (LC)	4	2	2	1.5	3
• Concentrator/ Explorer (CE)	3	3	2	1	0
• Explorer (E)	0	4	0	0	0
• Incidental/ Personal (IP)	0	1	0	0	0

SOURCE: Adapted from Campbell et al. 1981, p. 35.



NOTE: The letters used in this figure refer to the corresponding profiles specified in table 2 on page 10.

Figure 2. Hierarchy among target profile patterns

most of the available time not requested for other subjects in a vocational specialty. A Concentrator is defined as a person who does not necessarily use all electable credits in the specialty, but a substantial majority of them. The student with credits in a specialty in excess of five could still be classified as a Concentrator, since that condition would increase the distance from the target profiles to a greater degree than to the reference profile. The diversity score is set at one because the Concentrator is not likely to have many elective options, although a possibility for such options remains. The continuity score is set at four to reflect the likelihood of the true Concentrator pursuing the specialty throughout high school. Supportive diversity is set at one to offset a possible increase in distance if a nonspecialty course is taken and if there is a logical relationship between that course and the specialty of concentration. An example might be an accounting course taken by an agriculture student. The proximity score of three is the highest value for this descriptor and reflects dedication to the specialty in the last two school years.

- The second pattern was labeled Limited Concentrator because it seemed to reflect not only some exploration within the vocational field, but also a higher degree of course taking outside vocational education. The score of four has been assigned to intensity for this profile, to reflect the fact that concentration is present. Diversity receives a score of two; continuity is reduced to reflect the lessened concentration during the high school years. There is more opportunity for supportive diversity to occur, thus the score of one and one-half credits has been assigned to this profile. The proximity score remains at three, reflecting concentration in the last two years of high school.

- The third profile, Concentrator/Explorer, has a reduced intensity score of three credits because the opportunity for specialization is less in the early years of high school where concentration on this profile is postulated to occur. Greater diversity is reflected in a score of

three for this descriptor, possible because of the expanded opportunity in the later high school years. The continuity score remains the same as that for the previous profile, for a similar reason--the time requirements for the exploratory branching. Supportive diversity remains a possibility and thus a score of one is assigned. Lack of concentration in the later years of high school is reflected by a proximity score of zero.

- The fourth pattern, Explorer, fits cases where no predominant specialty is established, thus requiring a profile score of zero in intensity. Diversity characterizes this profile, however, as indicated by a score of four. Because continuity is defined in terms of a specialty, and because following a single specialty through more than one grade might easily result in qualifying for an intensity score, this target profile has a value of zero for this descriptive concept. In the absence of a qualifying specialty, supportive diversity cannot be present, requiring a score of zero. Similarly the absence of concentration requires a score of zero for the proximity concept.

- The final pattern, Incidental/Personal, was devised to reflect the substantial numbers of students who take one or two courses only, who do not develop any area of concentration, and who do not explore across enough specialties to be otherwise classified. Because at least one course must be taken, a one is assigned to diversity. None of the other descriptive concepts apply for this pattern: the profile scores are therefore set at zero. (Campbell et al. 1981, pp. 34-38).

The five designated target profiles were used to represent or define modal types. Consequently, in the Campbell et al. study the assignment of individual students to types was made by determining the target profile from which the student's profile had minimal distance. The actual student profiles classified as members of a pattern group were not expected to be exact matches to the target profile that defined the respective patterns. Instead, the student profiles clustered around each target profile.

In summary, application of the Patterns of Participation Model involved the following major steps:

1. Transcript data were used to obtain a profile for each student; that is, students sampled received a set of scores on the five dimensions based upon information contained in their transcripts.
2. Each student's profile was compared with each of the five target profiles and the related five distances calculated. The distance function used to compute each of the designated distances was based upon the sum of the squared differences between the values in the students' profiles and those in the respective target profile.
3. Lastly, the individual students were deemed to exhibit that "pattern of participation in vocational education" which their profiles most closely resembled.

Selected Results Obtained from Initial Application of the Patterns of Participation Model

During their efforts to explicate the Patterns of Participation Model further and to test its adequacy, Campbell et al. (1981) conducted several preliminary analyses based upon the 3,056 sample student transcripts gleaned from the NLS Study. The first of those analyses involved utilization of the model to classify students contained in the sample. Results of this classification are summarized in table 3.

The mean dimension scores observed for the subsamples of students classified under the various modal patterns were computed. Those averages, as well as the original target profile scores, are presented in table 4.

TABLE 3

FREQUENCY AND PERCENTAGE DISTRIBUTION OF THE PATTERNS OF PARTICIPATION

Name of Modal (Target) Pattern	Number of Cases (f)**	Percentages* Unadjusted	Adjusted
• Concentrator	345	10.8	13.8
• Limited Concentrator	577	18.1	23.1
• Concentrator/ Explorer	352	10.2	13.1
• Explorer	49	1.4	1.8
• Incidental/ Personal	1104	37.5	48.1
• No Vocational Credits	627	22.0	----
TOTAL***	3054	100.0	99.9

SOURCE: Adapted from Campbell et al. 1981, p. 44.
*The adjusted percentages represent the distribution of high school graduates with vocational credits.
**Two cases in the sample could not be classified.
***Totals may not equal 100.0 percent due to rounding.

TABLE 4

MEAN DIMENSION SCORES FOR STUDENTS CLASSIFIED IN THE VARIOUS MODAL PATTERNS

Name of Modal (Target) Pattern	Mean Dimension Scores* Intensity	Diversity	Continuity	Supportive Diversity	Proximity
• Concentrator	6.3 (5)	1.2 (1)	3.0 (4)	0.1 (1)	2.9 (3)
• Limited Concentrator	3.3 (4)	1.4 (2)	2.0 (2)	0.1 (1.5)	2.7 (3)
• Concentrator/ Explorer	2.6 (3)	1.5 (3)	1.7 (2)	0.0 (1)	1.0 (0)
• Explorer	0.0 (0)	3.1 (4)	0.0 (0)	0.0 (0)	0.0 (0)
• Incidental/ Personal	0.8 (0)	1.2 (1)	0.6 (0)	0.0 (0)	0.6 (0)

SOURCE: Adapted from Campbell et al. 1981, p. 46.
*The dimension scores posited for the five target profiles and presented earlier in table 2 are presented in parentheses.

TABLE 5

DESCRIPTIVE SUMMARY OF THE ASSIGNMENT SCORES FOR EACH PATTERN GROUP

Name of Modal (Target) Pattern	Descriptive Statistics: Mean	Standard Deviation
• Concentrator	7.4	9.2
• Limited Concentrator	5.0	1.8
• Concentrator/Explorer	0.9	1.6
• Explorer	0.9	0.3
• Incidental/Personal	2.9	2.6

SOURCE: Adapted from Campbell et al. 1981, p. 48.

In order to obtain an estimate of the "fit" of the sample transcript data to the target profiles, the mean dimension scores for each pattern group were computed and examined. The results of that assessment (i.e., the average distances of the students' profiles in each group from the respective target profiles) are summarized in table 5.

The results in table 5 show that the cases classified in the Concentrator/Explorer, Explorer, and Incidental/Personal groups clustered relatively closely around their related target profiles. For the Concentrator and Limited Concentrator groups, the distances from the related target profiles are substantially greater. These discrepancies are due in large part to the fact that in these groups the students often earn substantially more credits in vocational education than are utilized in the associated target profiles. Hence, they are assigned a greater

classification results with (1) race and sex and (2) program area of specialization as determined from the transcript data. The results of those two analyses are summarized in tables 6 and 7, respectively.

The multifaceted definition of participation in vocational education developed by Campbell et al. (1981) offered considerable promise for helping to resolve some of the problems inherent in employing the vocational-general-academic trichotomy. If it is to serve as a useful planning, administrative, and research tool in the future, the model's applicability and replicability need to be further explored and demonstrated. In the materials that follow, an effort is made to address these issues through the application of data provided by LEAs that cooperated in the Basic Skills Project reported by Weber et al. (1982).

TABLE 6

RELATIONSHIPS OF SEX AND RACE TO PATTERNS OF PARTICIPATION IN VOCATIONAL EDUCATION

Name of Modal (Target) Patterns	Sex x Race						Sex		Race		
	Female			Male							
	Black	Hispan	White	Black	Hispan	White	Female	Male	Black	Hispan	White
• Concentrator	10.8	10.5	13.3	10.3	9.1	8.3	13.0	8.5	10.8	10.0	10.8
• Limited Concentrator	23.1	23.5	20.3	16.7	16.0	14.4	21.1	14.6	20.4	19.2	17.7
• Concentrator/ Explorer	16.7	14.8	12.4	7.0	11.2	7.1	12.9	7.2	12.5	12.5	9.8
• Explorer	1.9	1.5	1.4	0.8	2.4	1.4	1.4	1.4	1.4	1.7	1.4
• Incidental/ Personal	32.8	35.2	36.8	35.6	36.6	39.2	36.3	38.9	34.1	36.6	38.0
• No Vocational Credits	14.7	14.5	15.3	29.5	24.6	29.6	15.2	29.4	20.8	20.0	22.3
• Column Totals*	100.0	100.0	100.0	99.9	99.9	100.0	99.9	100.0	100.0	100.0	100.0
• Total Cases	(163)	(62)	(1364)	(116)	(58)	(1291)	(1589)	(1465)	(279)	(120)	(2655)

SOURCE: Adapted from Campbell et al. 1981, p. 61.
NOTE: The entries in this table are percentages, except for those in the last row, which are frequencies.
*The percentages may not total 100.0 due to rounding.

TABLE 7

RELATIONSHIP OF PROGRAM AREA OF SPECIALTY TO PATTERNS OF PARTICIPATION

Name of Modal (Target) Pattern	Program Area of Specialty: Agr	Off Occ	T & I	DE	Health	Hm Ec	No Spec
• Concentrator	30.3	14.2	27.9	4.9	16.2	9.8	0.0
• Limited Concentrator	27.2	23.8	39.7	47.0	35.6	46.4	0.0
• Concentrator/ Explorer	17.6	15.5	14.3	16.1	37.8	26.6	0.0
• Explorer	0.0	0.0	0.0	0.0	0.0	0.0	4.0
• Incidental/ Personal	24.9	46.5	18.1	37.0	10.5	17.2	35.1
• No Vocational Credits	0.0	0.0	0.0	0.0	0.0	0.0	60.9
Column Totals	100.0	100.0	100.0	100.0	100.1	100.0	100.1
Total Cases	(110)	(1373)	(314)	(86)	(28)	(42)	(1101)
Column Percentages	3.6	45.0	10.3	2.8	0.9	1.4	36.0

SOURCE: Adapted from Campbell et al. 1981, p. 68.
NOTE: The entries in this table are percentages except for those in the next to last row, which are frequencies. The percentages in the table may not add up to 100.0 due to rounding.

DESCRIPTIONS OF THE SELECTED DATA SETS AND RELATED METHODOLOGY

The three LEA data sets used in this study represented somewhat different populations of schools, vocational programs, and students than were represented by the sample employed in the original "Patterns of Participation" study. With this in mind, an attempt is made in the information that follows to describe the selected data sets and to identify any major differences between those data and the original sample. In addition, the general sequence of activities implemented in order to apply the model to the designated data bases is outlined.

Summary Descriptions of the Selected LEA Data Bases

Three of the data sets described by Weber et al. (1982) contained sufficient transcript data for use in applying the Patterns of Participation Model. Those data were secured from Austin, Texas; Indianapolis, Indiana; and Philadelphia, Pennsylvania. Table 8 provides an overview of the numbers and kinds of students contained in each of the designated samples.

The information summarized in table 8 indicates that the selected samples of students did differ somewhat from the sample employed in the original Patterns of Participation study. In particular, in the three LEA samples, (1) two included higher proportions of male students (and conversely, lower proportions of female students) than the original "Patterns" sample, and one included about the same proportion; and (2) all three included significantly greater numbers of minority students than the original sample. (Based upon the results in the bottom row

TABLE 8

OVERVIEW OF THE STUDENTS IN EACH OF THE THREE SAMPLES

Data Base	No. of Students	Sex		Race			Misc.
		Female	Male	Black	White	Other	
• Austin	3326(with 1172 voc)	54%	46%	10%	73%	17% (Hispan)	-1513 seniors in 1979-80 & 1813 seniors in 1980-81
• Indianapolis	4640(with 4481 voc)	49%	51%	51%	48%	1%	-2656 seniors in 1979-80 & 1984 seniors in 1980-81
• Philadelphia	2238(with 1778 voc)	43%	57%	76%	17%	7% (Hispan)	-2238 seniors in 1980-81
• "Patterns of Participation" Sample	3054(with 1953 voc)	52%	48%	9%	87%	4% (Hispan)	-17+ yr. olds in 1979 (selection occurred in 1980)

of table 7 and the last column of table 14, it should also be noted that the distributions of students across vocational specialty areas in the three LEA samples differed appreciably from the corresponding distribution observed for the original sample. More specifically, in the current samples fewer agriculture, office occupations, and distributive education students, but more trade and industrial and home economics students were included than occurred in the original "Patterns" sample.) Furthermore, the original sample included students from a cross-section of schools in both urban and rural locations, while those in the three selected LEAs were drawn only

from urban settings. Finally, it should be noted that the samples from Austin and Philadelphia were purposively selected. That is, the students selected were chosen because they had complete, longitudinal basic skills data (i.e., from ninth through 12th grades), which could dramatically affect their representativeness.

In addition to the unique variations in sample characteristics among the three LEA data sets and those in the original sample, the transcript data provided also varied somewhat. Included among those variations were the following:

- Austin--This LEA changed from a quarter system to a semester system during the 1980-81 school year. Therefore, credit estimates for various vocational courses taken at different points in students' high school careers needed to be adjusted to reflect this change. The data set itself consisted of a listing of the vocational courses completed for each student sampled. The designation of the service area in which each course was classified was made by the LEA's vocational personnel.
- Indianapolis--The data provided by this LEA consisted of "complete high school transcripts" for the indicated sample of students. Accompanying these transcripts was a dictionary of course codes and descriptions that had to be used to differentiate between vocational and non-vocational courses as well as between different vocational courses, since the associated course identification designations varied across years (e.g., if D67 was

used to denote auto body II one semester, it might denote college algebra III or barbering the next semester). The designation for the service area in which each vocational course was classified was made by National Center staff who were vocational specialists, using a coding system developed from Standard Technology for Curriculum and Instruction in Local and State School Systems Handbook VI (Putnam and Chrismore 1970) as described by Campbell et al. (1981).

- Philadelphia--This data set consisted of "vocational transcripts" for the indicated sample of students. Each course was designated and classified into a specific service area via a Vocational Education Management Information System (VEMIS) code. The resulting VEMIS designations were employed during subsequent analyses.

Steps Followed in Applying the Patterns of Participation Model

The analysis of each of the three sets of transcript data proceeded as follows:

1. The subsample of students for which four years of vocational transcript data were available was identified. In particular, with regard to each student noted, it was imperative that for each course included in the associated transcript that--
   - the grade (i.e., ninth, tenth, eleventh, or twelfth) when the course was taken be specified;

- the service area category for the course be noted; and
- the number of credits (expressible in Carnegie Units) earned for the course be available.

2. Given the transcript data outlined in the previous step, summary information was generated for each student, such as--
   - a two-way (service area x year in school) matrix, where the cell entries were the numbers of vocational credits earned;
   - an accumulation of the number of credits earned in courses that could potentially qualify as supportive diversity courses. (See the last sentence of Appendix D, appearing here as figure 1 on page 9.)
3. Using the two-way matrix, the number of credits earned per service area, as well as the total number of credits earned by each student, was calculated and used to determine if the student had a "speciality area" or "area of concentration" (that is, if more than .6 of the total number of vocational credits the student earned was in a particular service area).
4. Based upon the information noted in the two preceding steps, the five modal dimension scores were calculated for each student (using the working definitions listed in table 1).

5. Next, the student's profile (i.e., set of five dimension scores) was compared with each of the "target" or "modal" patterns described in table 2, and the associated Euclidean distances* were calculated.
6. Using the Euclidean distances, the student was assigned to the "target" or "modal" pattern from which his or her profile had the smallest distance.
7. Finally, the summary transcript information (particularly that noted in steps 4 and 5) was combined with selected demographic data on the student, and analyses parallel to those summarized in tables 3 through 7 were completed.

*The Euclidean distances computed represent the sums of the squared differences between the students' observed scores on each of the five dimensions and the respective dimension scores associated with the target profiles.

RESULTS

When applying the Patterns of Participation Model to the three selected data sets, several exceptions or problems were encountered that required clarification of the related categorization and scoring rules defined in the model. In the materials that follow, a summary of those exceptions and problems is presented, along with descriptions of the associated resolutions. Then, the results of the application effort are presented.

Problems and Exceptions Encountered When Applying the Model

As indicated earlier, it was assumed that some unique problems and exceptions would be encountered and would have to be resolved during efforts to apply the Patterns of Participation Model to the selected data sets. One reason was that the model-related classification and scoring rules were originally derived and applied to a somewhat unique data set (sample) that was collected as part of an effort to develop a multifaceted characterization of participation patterns in secondary vocational programs. The extant data sets used in the current study were identified for completely different reasons. Consequently, the latter data sets did not necessarily incorporate the same information about the courses completed by the students sampled in the first data set, nor were the associated supportive details of the latter data set included in the original "Patterns of Participation" data set.

Table 9 contains a summary listing of a number of the concerns, problems, and exceptions encountered during the

TABLE 9

CONCERNS, PROBLEMS, AND EXCEPTIONS IDENTIFIED WHEN APPLYING THE PATTERNS MODEL

Data Set	Concern or Problem	Implication(s) for Generating Patterns Data	(a) Resolutions or (b) Further Needs
Austin	1. The school district shifted from a quarter to a semester system during the years when the sampled students were in high school.	• This shift affected the numbers of credits earned per course and the course identification codes. More specifically, this change affected the credit estimates that constituted the cell entries in the two-way matrix generated via the transcript data as well as the course year sequencing that defined the other dimension of that matrix.	(a) The issue of assigning course credits under the quarter and semester systems was addressed by converting LEA credits to Carnegie Units as dictated by the Patterns Model. Conflicts in course identification codes were addressed by designating the year when students completed the respective courses and assigning the appropriate course codes and credits based upon that variable. (b) There is still a need to resolve this problem since the philosophical and operational bases for designating numbers of class hours per course under the two systems are not necessarily equivalent and will vary across LEAs.
	2. The different vocational courses in this LEA were titled in a rather unique way and could only be matched with a limited range of the total spectrum of potential vocational courses and offerings listed in the Codebook for the Patterns of Participation Model.	• The net effect of this concern was to reduce the number of unique credits and years in which credits were earned, which subsequently influenced the entries in the two-way matrix generated from the transcript data and the supportive diversity credits accumulated.	(a) Given that the course titles and related content were defined by the LEA, nothing could be done to circumvent this concern. (b) This unresolved concern serves to point out the need to consider alternative definitions or conceptualizations of vocational course sequences under the Patterns Model and to delineate strategies for operationally reconciling differences among them. (It should be noted that this issue was not as pervasive a concern in the present study as it would be in a study that attempted to resolve patterns scores and results directly across LEAs.)
	3. Skill training in such areas as typing, bookkeeping, and accounting were subsumed within such courses as General Office Practices I, II, etc., and were taught in an integrated manner with other skills such as operating duplicating equipment, using good telephone manners, and fil[illegible].	• This concern had a direct bearing on the numbers of supportive diversity credits that were identified for different students.	(a) In order to address this problem, vocational specialists at the National Center were asked to review the description of courses identified as encompassing the three indicated skills and to specify those courses that should be designated as supportive diversity courses. (b) Although the preceding strategy addressed this concern, it points up the need to consider alternative definitions or conceptualizations of vocational education and the attendant courses considered under the Patterns Model more generally, and the supportive diversity dimension more specifically.

TABLE 9 (continued)

Data Set	Concern or Problem	Implication(s) for Generating Patterns Data	(a) Resolutions or (b) Further Needs
	4. Vocational courses were identified that did not fit under any particular service area as defined via the Patterns Codebook (e.g., courses in management training and certain co-op designations).	• The effect of this concern was to reduce the total number of vocational credits earned by students and summarized in the two-way matrix. It would also influence the designation of a specialty area.	(a) Since the designated courses could not be related in a one-to-one way with entries in the Patterns Codebook, they were not included as vocational courses during the analyses. (b) Although the indicated problem was addressed via the preceding strategy, it was not resolved. Furthermore, it serves to indicate two basic concerns with the Patterns Model. First, no decision rules are available in the current rendition of the model to resolve such issues when they arise. Second, when dealing with such courses as management training, no indication is provided regarding whether those courses should be used as part of the supportive diversity concept as well as the overall number of vocational credits accumulated for a student.
	5. Several of the vocational courses identified were placed by the LEA staff in service areas that were different than the service area classifications designated for the course titles in the Patterns Codebook (e.g., computer programming and data entry were classified as T&I courses rather than business and office courses).	• The classification of credits by service area in the two-way matrix could be directly affected by such course assignment conflicts.	(a) The courses were assigned to the Business and Office area as dictated in the Patterns Codebook. (b) Although in this instance the designated dilemma was resolved by using the assignment rule specified in the Patterns Codebook, that strategy did not resolve the underlying cause of the problem, which deals with the validity of assignments to various specialty areas--that is, do the course title and Patterns Codebook constitute a more valid basis for course assignments than LEA program personnel's opinions? Some general guidelines, if not specific decision rules, to address this issue directly should probably be included in the model.
Indianapolis	6. The course codes employed in this district changed over successive semesters and years, which meant that the course code used to denote machine shop one semester might be used to denote a barbering course or college algebra course the next semester or year.	• This issue could influence the assignment of cell entries in the two-way matrix that was generated using the transcript data.	(a) The concern was addressed by specifying the beginning and ending times for each course, designating the semester and year when the students completed the course, and assigning the appropriate credits in the correct service area-time combination when matches were noted. (b) This concern highlights the fact that local vocational programs and related courses are dynamic and changing, not static. Such an issue suggests that in order to "keep up with the times, a scheme such as the Patterns Model

TABLE 9 (continued)

Data Set	Concern or Problem	Implication(s) for Generating Patterns Data	(a) Resolutions or (b) Further Needs
			might be more enduring and remain contemporary for a longer period of time if it focused upon general course areas and assignments rather than specific courses and course titles.
	7. A number of ambiguities and assignment questions arose during efforts to match LEA course titles with those listed in the Codebook for the Patterns of Participation Model. For example, was an electricity I course, a specialized physics course for college-bound students or a vocational (trade and industry) course.	• This issue could have a direct bearing on the magnitude of the entries in the two-way matrix observed in the students' transcripts as well as the total number of vocational credits they might accumulate.	(a) In order to resolve such ambiguities, vocational specialists from the National Center staff were asked to review the available descriptive materials and designate whether or not the courses in question could be considered vocational courses. Although such a tactic was primarily used to resolve questions regarding whether courses were "vocational courses" or not, on occasion the results had implications for identifying supportive diversity courses as well. (b) This concern points out the need to include in the Patterns Model or associated Codebook decision rules, or perhaps simply suggestions, for resolving ambiguities such as the one noted. The number of such questions is likely to increase as the "Technical" service area continues to expand in terms of offerings and enrollments. Also, the emergence of such questions tends to illustrate some of the operational limitations inherent in the Patterns Codebook and its attendant listing of potential course titles, which is over ten years old.
	8. The data set for this LEA included complete high school transcripts for the selected students and, as a result, gave rise to a number of concerns regarding the definition of supportive diversity (e.g., What is "individual entrepreneurship" and how is it operationalized	• This concern has direct implications both for the designation of supportive diversity specialty areas as well as the numbers of supportive diversity credits that can be acquired by students.	(a) During the application of the model, the areas and specific courses noted in figure 1 of the Patterns Model were employed, and every effort was made to apply the rules implied therein as faithfully as possible. (b) Although this issue was resolved in a rather straightforward manner, it does point out a need to explicate and strengthen the definition and operational specifications surrounding the supportive diversity concept to

TABLE 9 (continued)

Data Set	Concern or Problem	Implication(s) for Generating Patterns Data	(a) Resolutions or (b) Further Needs
	and manifested?) and specification of related courses (e.g., Should credit be given for biology and chemistry taken by nurses' aides or algebra and geometry taken by an electronics repairperson?).		the Patterns Model. For example, why are certain T&I sub-areas specified as "structured toward individual entrepreneurship," but not others?
Philadelphia	9. The vocational transcript data supplied were coded by the VEMIS system, which appears to be a somewhat more gross classification system than that specified in the Codebook for the Patterns of Participation Model.	• In terms of the summary data generated from the student transcripts, this issue might mean that the numbers of supportive diversity credits assigned to individual students might be fewer than the number that would be assigned had the system in the Codebook been applied.	(a) Nothing unique was done to address the concern--the courses noted as typing, accounting, and bookkeeping under the VEMIS system were denoted as the supportive diversity courses and associated credits were accumulated accordingly. (b) From a more general perspective, this concern relates to that described in 3 (b) and more directly, 4 (b), the need to have the model focus more upon general course areas and assignments, rather than on specific courses. If such a tactic is employed, there may be some need to redefine or revise the definitions of one or more model dimensions e.g., the supportive diversity dimension), and to alter the nature of the associated scoring rules.
	10. Under the VEMIS system, industrial arts courses are not classified, but certain "useful" (as opposed to "occupational") home economics courses are classified as vocational courses.	• This concern could affect the numbers of credits accumulated in certain service areas in the two-way matrix generated from the student transcript data.	(a) The home economics courses deemed to be "useful" home economics under the VEMIS system were not treated as vocational courses. (b) It should be noted that although the issue of industrial arts and home economics course assignments could be addressed in this instance, the related discussion and operational procedures outlined in the Pattern Codebook could be strengthened.
	11. This assignment of individual courses to service areas was completed by LEA personnel using the VEMIS system, and the resulting classifications did not always match in a one-to-one way the classifications that	• Such discrepancies, should they exist, could affect the cell entries in the two-way matrix derived from the student transcripts, as well as the numbers of supportive diversity credits that are accumulated.	(a) Given the fact that the course assignments were made by LEA personnel, it was assumed that they "know their courses best" and no changes were made. (b) Although nothing was done in the current study to resolve this potential concern, since an extant data base was being employed, some discussion of such issues should perhaps be included in the Patterns Codebook so the reader is at least aware of the "preferred" approach for dealing with such classification anomalies.

TABLE 9 (continued)

Data Set	Concern or Problem	Implication(s) for Generating Patterns Data	(a) Resolutions or (b) Further Needs
	would be assigned using the Patterns Codebook. For example, a series of small engine repair courses might be assigned to the agricultural area in one system, while it is assigned to T&I under the other.		
	12. The titles employed in this data set were such that some concerns surfaced regarding the designation of specialty areas that would qualify as supportive diversity programs.	• This issue could have implications for denoting whether or not a student pursued a specialty area that qualified as a supportive diversity program.	(a) Vocational specialists on the National Center staff assigned ambiguous or questionable areas to the subset of supportive diversity programs. (b) Although this tactic addressed the issue in this instance, it did nothing to resolve the lack of specificity and explicitness in the Codebook with regard to the designation of specialty areas that would qualify as programs under the supportive diversity dimension. (See the related concerns raised under 6 (b) as well.)
All Three Cooperating LEAs	13. Distributive education and certain other vocational programs are "discriminated" against by the Patterns Model, since they include relatively fewer courses than certain other areas (e.g., agriculture and business/office education) and are often offered only late in the students' high school careers.	• This concern has a direct relationship to the number of credits accumulated per service area in the two-way matrix of course credits generated from available transcript data.	(a) In the current study no attempt was made to alter the model to accommodate the indicated concern. (b) It might be worthwhile during future efforts to refine the Patterns Model to attempt to discern the maximum numbers of credits (per LEA) that can be earned per service area and subsequently to weight the credits attained per area by these values. Such an adjustment process would likely have significant effects upon students' intensity and continuity scores as well as the designation of program specialties.
	14. The model appears to "favor" LEAs that offer a "traditional" comprehensive vocational program (such as those offered by the three cooperating LEAs), rather than LEAs that have programs that are of relatively short duration and encompass fewer specific courses.	• This concern, although not a direct concern in the current study, could have major implications for studies in which the credits in the two-way matrices that are generated per LEA are compared, contrasted, combined, and the like.	(a) No attempt was made to address this issue in the current study since the three LEAs did have traditional, comprehensive programs that reflected many of the tenets that characterize the Patterns Model. (b) As indicated, this concern could have major implications for studies in which attempts are made to look at vocational participation patterns across LEAs, particularly if several of those LEAs involve more "nontraditional" vocational programs (e.g., programs that are shorter in length than the two or more years that tend to represent the mode in most states and locales).

application of the Patterns Model to the selected data sets. Table 9 presents issues such as the following:

- LEAs define and offer more general courses that oftentimes subsume specific courses listed in the "Patterns" Codebook;
- during the sampled students' high school years, the LEA shifted from a quarter to a semester system;
- the definition of the supportive diversity concept and the specification of related courses; and
- certain vocational programs are "discriminated" against.

In addition, table 9 lists the approaches that were used to address and hopefully resolve each designated concern. Also, the implications of each concern as they relate to the generation of the requisite patterns data are noted.

Replication/Verification Results--Descriptions of Observed Participation Patterns

In the original Patterns of Participation study, several analyses were conducted to help explicate and describe the Patterns of Participation Model. The first set of analyses dealt with the following issues:

- The distribution of students across the various participation patterns identified using the model;
- The average observed dimension scores for students classified in the various participation patterns (as compared with the target profile scores); and
- The summarization of the assignment scores for each pattern group in an effort to obtain an estimate of the

"fit" of the sample data to the respective target profiles.

The results of these analyses were summarized earlier in tables 3 through 5.

During the first stage of the application or replication and verification effort conducted as part of the current study, a series of analyses parallel to those described for the original sample were undertaken. The results of those analyses are summarized in tables 10 through 12.

Table 10 shows the distribution of students across the various participation patterns that were observed for each of the selected LEA samples. These results revealed the following:

- There were no overall trends across the three LEAs with regard to the distribution of students and their participation in vocational education (i.e., the distributions of students across patterns differed for the designated LEAs).

TABLE 10

FREQUENCY AND PERCENTAGE DISTRIBUTIONS OF PARTICIPATION PATTERNS OBSERVED ACROSS COOPERATING LEAS

Modal (Target) Pattern	LEAs								
	Austin			Indianapolis			Philadelphia		
	# of Cases	Percentages* Unadj	Adj	# of Cases	Percentages* Unadj	Adj	# of Cases	Percentages* Unadj	Adj
• Concentrator	272	8.4	27.1	1558	33.6	34.8	945	42.2	50.3
• Limited Concentrator	495	15.3	49.4	454	9.8	10.1	313	14.0	16.7
• Concentrator/ Explorer	72	2.2	7.2	811	17.5	18.1	181	8.1	9.6
• Explorer	1	0.0	0.1	523	11.3	11.7	18	.8	1.0
• Incidental/ Personal	162	5.0	16.2	1135	24.5	25.3	421	18.8	22.4
• No Vocational Credits	2234	69.0		159	3.4	----	360	16.1	----
TOTAL	3236	99.9	100.0	4640	100.1	100.0	2238	100.0	100.0

*The adjusted percentages represent the distributions of students sampled who had vocational credits. Totals may not equal 100.0 percent due to rounding.

- The largest percentage of students for Indianapolis and Philadelphia were concentrators, with the second largest percentage being incidental/personal, but for Austin the largest percentage of students were limited concentrators with the second largest percentage being concentrators.
- The distributions of students across the five participation patterns for the three individual LEAs differed substantially from the distribution reported by Campbell et al. (1981).
- Even the combined average distribution of students for the three cooperating LEAs differed substantially from that reported by Campbell et al. (1981)--in particular, for the combined distribution the number of concentrators was significantly greater than that noted in the earlier study, while the number of incidental/personal students was significantly smaller.

The results summarized in table 11 show the average dimension scores for students classified in the various participation patterns for each of the three cooperating LEAs. The results suggest that--

- considerable similarity existed among the average dimension scores for the five modal patterns for the students in the three cooperating LEAs;
- the average dimension scores observed for students in the cooperating LEAs were also quite similar to those presented in table 4, which were derived from the NLS subsample.

TABLE 11

MEAN DIMENSION SCORES FOR STUDENTS CLASSIFIED IN THE VARIOUS MODAL PATTERNS

Modal (Target) Pattern	Dimension Scores	LEAs		
		Austin	Indianapolis	Philadelphia
• Concentrator	Intensity	6.6	6.9	7.4
	Diversity	1.0	1.7	1.1
	Continuity	2.3	3.4	2.7
	Supportive Diversity	0.0	0.2	0.0
	Proximity	2.9	2.5	2.7
• Limited Concentrator	Intensity	3.9	3.8	3.6
	Diversity	1.1	1.8	1.3
	Continuity	1.2	2.2	1.8
	Supportive Diversity	0.0	0.2	0.0
	Proximity	2.1	2.5	2.3
• Concentrator/ Explorer	Intensity	3.6	3.3	3.1
	Diversity	1.1	1.8	1.3
	Continuity	1.3	1.9	1.6
	Supportive Diversity	0.0	0.1	0.0
	Proximity	0.9	0.4	0.8
• Explorer	Intensity	0.0	0.0	0.0
	Diversity	3.0	3.1	3.0
	Continuity	0.0	0.0	0.0
	Supportive Diversity	0.0	0.0	0.0
	Proximity	0.0	0.0	0.0
• Incidental/ Personal	Intensity	1.6	0.5	0.7
	Diversity	1.1	1.6	1.3
	Continuity	0.9	0.4	0.5
	Supportive Diversity	0.0	0.0	0.0
	Proximity	1.3	0.1	0.5

Table 12 contains summarizations of the assignment scores observed for each pattern group for each of the three data sets. Those results revealed the following:

- The average squared differences or discrepancies from the modal patterns observed for students classified in the concentrator, limited concentrator, concentrator/explorer, and explorer groups in the three LEAs were very similar.
- The average discrepancy for the Austin students classified in the incidental/personal category was somewhat greater than the corresponding group averages observed for students in the other two districts.
- The relative magnitude of the discrepancies observed for the NLS subsample and the three LEAs (combined) were quite similar except for the concentrator/explorer group--in that case the average discrepancy for the students from the LEAs was significantly greater than the one observed for students from the NLS subsample.

TABLE 12

OVERVIEW OF THE ASSIGNMENT SCORES OBSERVED FOR THE VARIOUS PATTERN GROUPS

Modal (Target) Pattern	Descriptive Statistics	LEAs		
		Austin	Indianapolis	Philadelphia
• Concentrator	Mean	8.2	10.4	12.4
	Standard Deviation	5.0	10.2	8.0
• Limited Concentrator	Mean	5.3	4.4	5.9
	Standard Deviation	0.8	2.3	1.9
• Concentrator/ Explorer	Mean	7.3	4.9	6.7
	Standard Deviation	0.9	2.2	1.9
• Explorer	Mean	1.0	0.9	1.0
	Standard Deviation	0.0	0.3	0.0
• Incidental/Personal	Mean	6.3	1.9	2.7
	Standard Deviation	2.7	1.7	2.2

Replication/Verification Results--Demographic Characteristics of Students Classified under Various Participation Patterns

In an effort to help determine the relative influences and effects of vocational course taking at the secondary level, Campbell et al. (1981) undertook several analyses in which they compared the Patterns classification results with race and sex, and with program area of specialization. The results of those two analyses were summarized earlier in tables 6 and 7.

As part of the current study, several analyses parallel to those conducted by Campbell et al. were completed. The results of these analyses are summarized in tables 13 and 14.

The summary results presented in table 13 suggest the following:

TABLE 13
RELATIONSHIPS OF SEX AND RACE TO PATTERNS OF VOCATIONAL COURSE TAKING

LEAs	Variable(s)	Levels	Patterns* C	LC	C/E	E	I/P	No Crd
• Austin	Sex x Race	Female-Black	15	21	2	0	14	48
		-White	8	16	2	0	4	70
		-Other	18	22	3	0	7	50
		Male-Black	8	10	4	0	4	74
		-White	5	9	2	0	3	81
		-Other	10	19	3	0	7	61
	Sex	Female	10	19	2	0	6	63
		Male	6	11	3	0	4	76
	Race	Black	12	17	3	0	11	57
		White	6	13	2	0	4	75
		Other	14	21	3	0	7	55
• Indianapolis	Sex x Race	Female-Black	31	7	18	17	26	1
		-White	30	10	19	10	27	4
		-Other	40	0	40	0	20	0
		Male-Black	34	12	17	12	22	3
		-White	39	11	15	6	23	6
		-Other	42	5	16	5	32	0
	Sex	Female	30	8	19	14	26	3
		Male	37	11	16	9	23	4
	Race	Black	32	10	18	14	24	2
		White	35	10	17	8	25	5
		Other	41	4	24	3	28	0
• Philadelphia	Sex x Race	Female-Black	40	14	8	1	25	12
		-White	60	17	4	0	7	12
		-Other	35	19	9	0	21	16
		Male-Black	38	16	9	1	17	19
		-White	60	5	6	0	9	20
		-Other	39	15	12	5	8	21
	Sex	Female	42	14	8	1	22	13
		Male	42	14	8	1	15	20
	Race	Black	39	15	8	1	21	16
		White	60	10	5	0	8	17
		Other	38	16	11	3	13	19

*The indicated patterns are as follows: C=Concentrator, LC=Limited Concentrator, C/E=Concentrator/Explorer, E=Explorer, I/P=Incidental/Personal, and No Crd=No Credits. The entries in each of the columns are percentages.

- That for the three cooperating LEAs, the distributions of males and females within LEAs who were classified in each of the five Patterns groups were similar. This does not mean, however, that the distributions across LEAs were similar, as was indicated by the results summarized in table 10.
- For Austin and Indianapolis, the distributions of students of different races who were classified in each of the five Patterns groups were similar, but for Philadelphia the number of white students classified in the concentrator group was greater than the number of blacks and other minorities classified in that group. (Furthermore, as in the preceding finding, this does not mean that the distributions across LEAs were similar, as was described via the results presented in table 10.)
- The general similarity of distributions for students of different sexes and races across different Patterns groups observed for the three LEA samples closely parallel the findings reported by Campbell et al. (1981) for the NLS subsample (as summarized in table 6).

The comparison between the Patterns classification and program area of specialization in table 14 revealed the following:

- The distribution of students who were assigned to the various Patterns by specialty area within each of the LEAs differed substantially, and no trends were

TABLE 14

RELATIONSHIPS OF PROGRAM AREA OF SPECIALTY TO PATTERNS OF VOCATIONAL COURSE TAKING

LEAs	Specialty Areas	Patterns* C	LC	C/E	E	I/P	No Crd	% per spec. area
• Austin	Agriculture	66	9	21	0	4	0	1
	Office Occupations	31	40	5	0	24	0	10
	Trade & Industry	31	50	7	0	12	0	8
	Distributive Educ.	19	64	62	0	5	0	5
	Health	7	58	4	0	31	0	1
	Home Economics	16	67	4	0	13	0	5
	No Specialty	0	0	0	0	1	99	70
• Indian-apolis	Agriculture	---	---	---	---	---	---	0
	Office Occupations	39	14	26	0	21	0	31
	Trade & Industry	58	15	18	0	9	0	28
	Distributive Educ.	0	66	19	0	15	0	1
	Health	16	46	23	0	15	0	1
	Home Economics	52	5	40	0	3	0	10
	No Specialty	0	0	0	38	50	12	30
• Phila-delphia	Agriculture	---	---	---	---	---	---	0
	Office Occupations	44	20	11	0	25	0	37
	Trade & Industry	75	13	9	0	3	0	32
	Distributive Educ.	10	20	50	0	20	0	0
	Health	0	81	19	0	0	0	1
	Home Economics	44	35	16	0	5	0	5
	No Specialty	0	0	0	3	34	63	25

*The indicated patterns are as follows: C=Concentrator, LC=Limited Concentrator, C/E=Concentrator/Explorer, E=Explorer, I/P=Incidental/Personal, and No Crd=No Credits. The entries in these columns are percentages.

discernable except for the explorer group. This was due to the limited number of students assigned to that category.

- The only trend observed across the three samples in the distribution of students to Patterns across specialty areas was that in the distributive education and health areas, relatively few students were classified as

concentrators (most of them were classified as limited concentrators), whereas in the office occupations and trade and industrial areas, the "modal student" would most likely be classified as a concentrator.

- The distributional variability across specialty areas and the trends indicated earlier that were observed for the three LEA samples were similar to the findings reported by Campbell et al. (1981) for the NLS subsample, even though the relative numbers of students representing different specialty areas in the two instances were quite different (as shown by the last row of table 7 and the last column of table 14).

SUMMARY

In conducting the study described in this document, three basic procedures were followed: (1) the multidimensional model for describing secondary students' patterns of participation in vocational education developed by Campbell et al. (1981) was applied to the high school transcripts of samples of students from three urban LEAs, (2) problems and concerns encountered during those applications were identified, and (3) an attempt was made to discern how well the outcomes evolving from the three applications replicated the results obtained earlier by Campbell et al. In addition, major conceptual or operational problems or concerns encountered during the efforts to apply the Patterns model were noted and attempts were made to resolve them. A summary of those results (presented in table 15) suggests that while no debilitating problems were encountered during the applications of the model (i.e., the definitions and decision rules specified in the model could be "reliably" applied), a number of conceptual and operational concerns did surface and have implications if the model is to be used on a more widespread basis (e.g., by state or LEA planners and program personnel).

In observing how closely the classification outcomes replicated the relationships noted by Campbell et al. (1981) the results summarized in tables 10 through 14 suggest that--

1. The Patterns Model was applied in a fairly reliable manner to the three data sets. Such a conclusion is warranted by the results presented in tables 11 and 12, which closely

TABLE 15

OVERVIEW OF THE CONCERNS IDENTIFIED WHEN APPLYING THE PATTERNS MODEL

Concern or Problem	Related Recommendation(s)
1. Reconciliation and aggregation of earned credits under vocational programs offered on a quarter, trimester, or semester basis.	Although this concern has been addressed in the model via the conversion of credits to Carnegie Units, some mention should probably be made of the issue, and its philosophical--if not operational--ramifications should be discussed.
2. LEAs employed unique course titles that did not correspond directly with those listed in the Patterns Codebook.	Course titles and related materials in the Patterns Codebook should be expanded and include more examples and descriptive details. The titles employed may need to be updated to reflect current terminology, and so forth.
3. LEAs define and offer more general courses that often subsume specific courses listed in the Patterns Codebook (e.g., Office Practices, which incorporate typing, bookkeeping, telephone manners, office machine operation, and filing).	Specific guidelines for how credits are to be assigned relative to those kinds of courses need to be provided. In particular, how "supportive diversity" credits, if applicable, are to be assigned needs to be provided. Consideration might also be given to using more general units, other than specific courses, as the basis for the generation of model-related scores.
4. Courses were identified that did not fit under any of the service areas designated in the model (e.g., management training).	Changes need to be made in the model so that such courses (and their associated credits) can be routinely included. Furthermore, in cases like the one cited, provisions need to be made to utilize such courses during the derivation of supportive diversity scores.
5. Discrepancies were observed between LEA personnel's service area classifications of	Specific guidelines for reconciling such differences need to be provided. (It would seem that personnel would be able to make

TABLE 15 (continued)

Concern or Problem	Related Recommendation(s)
various courses and those dictated by the Patterns Codebook.	the most valid classifications, but the results may be very difficult to standardize across LEAs, which is one of the main reasons for employing the Codebook.)
6. Designation of selected courses as vocational or nonvocational (e.g., Is Electricity II an advanced physics course or vocational course?).	The course descriptions provided in the Patterns Codebook should be expanded somewhat, examples of potential "problem" courses in each service area should be highlighted, and the decision rules for dealing with questionable courses should be strengthened.
7. Definition of the supportive diversity concept as well as such related notions as "individual entrepreneurship."	The definition of the supportive diversity concept (as well as its related concepts) needs to be improved (particularly in lieu of the fact that so few students receive any score at all on this dimension).
8. Disposition of industrial arts and home economics courses.	The related discussion and decision rules described in the Codebook should be expanded and improved (e.g., How is a course designated as home economics IV to be classified?--Is it a "useful" or "occupational" home economics course?).
9. Certain vocational programs (e.g., distributive education) are "discriminated" against by the model, since they include fewer courses and are offered late in students' high school careers.	Change the scoring rules so that the credits earned by students per service area are weighted by the total number of credits they can earn in that service area. Redefine several dimension scores (e.g., the intensity and continuity scores).
10. The model "discriminates" against programs offered by LEAs that are nontraditional (e.g.,	Some mention should be made regarding such nontraditional programs, along with the associated decision rules. In

TABLE 15 (continued)

Concern or Problem	Related Recommendation(s)
vocational programs that are only a year or less in length).	some states such programs are quite pervasive and represent the norm. (In such instances, students' scores on all five model dimensions will be affected.)

parallel those presented in tables 4 and 5, as reported by Campbell et al. (1981).

2. The distributions of students across participation patterns for the three LEAs and the demographic characteristics of students classified in terms of various participation patterns did differ appreciably from the corresponding distributions and characteristics reported by Campbell et al. (1981). Those differences, however, could have been due as much to variations between the current, composite sample (i.e., from all three LEAs) and the sample employed in the original Patterns study. Overall, these results confirm the applicability of the Patterns Model to data sets other than that from which it was derived and demonstrate that such applications can be conducted in a reliable manner.

This does not mean, however, that those results document the model's validity, nor the validity of its underlying tenets. Such issues would need to be the focus of future research activities. Several studies related to these issues have recently been and are in the process of being completed. They are of the "predictive validity" type. They focus upon questions regarding whether there are distinct differences in various vocationally related outcomes as a result of classification via the Patterns Model. Although similar results might be obtained in some areas by use of percent of credits, other areas, such as the effect of "exploring," cannot be evaluated simply by use of credits alone. In a companion study to the current effort the classification results observed for the three LEAs will be related to variations in vocational students' basic skills.

IMPLICATIONS OF PATTERNS MODEL FOR VOCATIONAL ADMINISTRATORS

The pattrns of participation model provides a more refined basis for identifying and describing students associated with vocational education programs. As a more sensitive framework for describing students, it provides an improved basis for making decisions about planning and executing vocational offerings. The following list of itmes are intended to suggest how the vocational administrator and researchers may benefit from using the Patterns model:

Program Planning

- Issues and concerns for the vocational administrator center around student enrollment. An analyses of enrollment patterns through the use of a more sophisticated tool will permit better utilization of staff, facilities, and finances.
- The Patterns model graphically portrays to the administrator that--
  - Students classified as concentrators have better vocational skills that permit them to achieve in the world of work at a higher level of proficiency.
  - The larger number of concentrators associated with the program, the better utilized are the professional staff, the facilities and the budget.

Counseling

- The counselor can use the Patterns model as a more sophisticated tool in assessing how well a student would

select a vocational program area is likely to reach the goals he sets out to achieve.

- The Patterns model may be a useful tool in conjunction with other data about the student in assessing the strengths and weaknesses of the students' decision-making process. This occurs when the counselor evaluates the congruence of the students stated goals and their pattern of participation.

Marketing

- An analysis of past student enrollments in a program using the Patterns model can provide for the school counselor a more sophisticated basis for enticing new students to enroll in programs.
- An analysis of the successes of concentrator students in a vocational program can provide needed ammunition for an administrator who wishes to sell that program to business, industry and labor, who is looking for on job training positions or additional monies to expand the course offerings.

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